```
                                        args.put(ArgKeys.KEY_KEY_ID, new
UNIRShort((short)InParam.m_KeyID));

                        }
                        return args.toByteArray();
                    }
                    catch(Exception e){}

                    return null ;
                }

        //*************************************************************************
*
                // Convert OpKeyOut structure to a byte array for the
UNIRInstruction
        //*************************************************************************
*
            public byte[] getOpKeyOutAsArray()
            {
                return m_OpKeysOut.getOpKeyOutAsArray();
            }


        //*************************************************************************
*
                // String representation of this Enhancement
        //*************************************************************************
*
            public String toString()
            {
                String s = m_GUON + " [" ;

                for (Enumeration EK = getInIterator(); EK.hasMoreElements(); )
                {
                        OpInputParam InParam = (OpInputParam)EK.nextElement();
                                s += "(" + InParam.m_OpGUON + ":" +
InParam.m_OpNum + ":" + InParam.m_KeyIndex + ":" + InParam.m_KeyID+")";

                }

                s += "] , [" ;

                for (Enumeration EK2 = m_OutFields.elements();
EK2.hasMoreElements(); )
                {
                        String OutFld = (String)EK2.nextElement();
```

```
                        s += "("+OutFld+")";

                }
                s+=  "} , [" ;

                for (Enumeration EK3 = getOutputGUONKeys();
EK3.hasMoreElements(); )
                {
                        Pair GuonKey = (Pair)EK3.nextElement();
                                s += "("+GuonKey+")";

                }

            s += "] , " +
                                m_ISMID + ":" + m_GathererID + ":" + m_NodeID ;
                        return s ;
                }


        //*************************************************************************
*
                // to support special operation of slist

        //*************************************************************************
*
                public boolean equals(Object obj)
                {
                        return ( m_GUON == ((EnhanceOpNode)obj).getGUON() );
                }


        //*************************************************************************
*
                // to support special operation of slist

        //*************************************************************************
*
                public int hashCode()
                {
                        //byte v1 = (byte)(m_GUON & 0x000000ff) ;
                        byte v1 = 0 ;
                        int  v2 = 0 ;
                        if (!m_FieldID.equals(""))
                                v2 = m_FieldID.hashCode() & 0x0000ffff ;
                        return ( v1 << 24) + (v2 << 8) + m_OpNum ;
                }


        }
```

```
//*****************************************************************

5   //*****************************************************************
```

CLAIMS

What is claimed is:

1. A system for tracking network session information, the system comprising:

an information source module having a source information input and a standardized information output, a source information corresponds to network usage information, a standardized information corresponds to the network usage information transformed into a standard format;

a first program having at least a first standardized information input and an enhanced data output, a first standardized information input corresponding to the standardized information, an enhanced data corresponding to the standardized data after at least a partial transformation, the at least partial transformation being defined according to a data record format;

a second program having at least a first enhanced data input and a data record output, the first enhanced data corresponding to the enhanced data, a data record corresponding to the first enhanced data, the data record being formatted according to the data record format;

a database storing the data record; and

wherein the second program merges duplicate data records that represent the same network usage information.

2. The system of claim 1 wherein the at least partial transformation is defined from a data enhancement procedure, and wherein the data record format includes a plurality of fields and wherein the data enhancement procedure defines how the standardized information is to be transformed into the plurality of fields of the data record format.

3. The system of claim 2 wherein the data enhancement procedure includes at least a field enhancement wherein the field enhancement defines a source for a predetermined field in the plurality of fields.

4. The system of claim 2 wherein the data enhancement procedure includes at least a field enhancement wherein the field enhancement defines a function to be applied to at least a portion of the standardized data.

5. The system of claim 2 wherein the data enhancement procedure defines a plurality of field enhancements, wherein each field enhancement defines network usage information to be stored in the plurality of fields.

6. The system of claim 5 wherein at least a first field enhancement corresponds to an information source module that performs aggregation on at least a portion of the network usage information to be stored in at least a first field in the plurality of fields.

7. The system of claim 6 wherein the aggregation occurs by aggregating packet flow information, the packet flow information corresponding

to a plurality of packets. where each packet in the aggregated packets has the same IP source address, destination address and port information.

8. The system of claim 5 wherein at least a first field enhancement corresponds to a set of information source modules that performs filtering and aggregation on at least a portion of the network usage information to be stored in at least a first field in the plurality of fields.

9. The system of claim 5 wherein at least a first field enhancement corresponds to a set of information source modules that performs merging, filtering, and aggregation on at least a portion of the network usage information to be stored in at least a first field in the plurality of fields.

10. The system of claim 5 wherein at least a first field enhancement corresponds to a set of information source modules that performs event notification and provisioning activation.

11. The system of claim 2 further comprising a second information source module, the second information source module having a second source information input and a second standardized information output, a second source information corresponds to a second network information, a second standardized information corresponds to the second network information transformed into a standard format, and wherein the data enhancement procedure includes a first definition of at least a first field in the plurality of fields being from the standardized information, and at least a second definition

of a second field in the plurality of fields being from the second standardized information.

12. The system of 11 further comprising a first information source and a quality of service information source, and wherein the information source module receives the network usage information from the first information source, and wherein the second information source module receives the second network information from the quality of service information source, and wherein the first definition defines that a source IP address supplied by the first information source should be put into the first field, and wherein the second definition defines a supplied by the DNS server should be put into the second field.

13. The system of claim 1 wherein the second program manages the first program and the information source module.

14. The system of claim 1 wherein the second program causes the data record to be stored in the database.

15. The system of claim 1 wherein the information source module is configured to receive the network usage information from a predetermined network device.

16. The system of claim 1 wherein the at least partial transformation includes policy-based data aggregation which defines how network usage data should be aggregated.

17. The system of claim 1 wherein the network usage information includes IP session data.

18. The system of claim 1 wherein the data format includes a plurality of fields including a source IP field, a destination IP field, a source host field, a destination host field, a service type field, a date and time field, a duration field, a total number of bytes field, and a counter field.

19. The system of claim 1 further comprising a customer care and billing system coupled to the database, the customer care and billing system for accessing the database to generate a bill from the data record.

20. A network usage accounting system comprising:

an information source module coupled to receive network information from a network device;

a gatherer coupled to receive the network information source module, the gatherer for performing data enhancements on the network information to create a plurality of data records;

a central database storing the plurality of data records; and

a central event manager coupled to receive the plurality of data records, the central event manager merging duplicate records in the plurality of data records, the duplicate records representing the same network usage information.

21. The system of claim 20 wherein the information source module is configured to receive network information from a network device chosen

from the group of network devices consisting of a proxy server, a domain name service server, a firewall, a RADIUS server, and a router.

22. The system of claim 20 wherein the gatherer performs filtering and aggregation on the network information.

23. The system of claim 20 wherein the plurality of data records have a predefined data format comprising a plurality of fields, and wherein the data enhancements includes at least a first data field enhancement to enhance the network information to fill in the first data field.

24. The system of claim 23 wherein the first data field corresponds to a source IP address field and wherein the data enhancement includes extracting a source IP address value from the network information.

25. The system of claim 23 wherein the first data field corresponds to a domain name field and wherein the data enhancement includes requesting a domain name from a domain name service server.

26. A method of gathering and aggregating network usage information from a set of network devices, the system using at least a first program and a second program coupled in communications, the method comprising:

accessing network communications usage information;

filtering and aggregating the network communications usage information using the first program;

completing a plurality of data records from the filtered and aggregated network communications usage information, the plurality of data records corresponding to network usage by a plurality of users;

storing the plurality of data records; and

merging duplicate records in the plurality of data records.

27. The method of claim 26 wherein completing the plurality of records includes accessing user account information.

28. The method of claim 26 wherein completing the plurality of records includes for each data record determining a corresponding source IP address, a corresponding domain name, a corresponding type of service used, and a corresponding amount of time used.

29. The method of claim 26 wherein the system includes a third program coupled in communications with at least the second program and wherein completing the plurality of records includes accessing the third program to determine network account information and including the network account information in at least a first record in the plurality of records.

30. The method of claim 26 wherein merging the duplicate records includes comparing a plurality of fields in the data records to identify data records corresponding to the same network session and merging the corresponding records.

31. The method of claim 26 wherein merging the duplicate records includes automatically deleting a duplicate record.

32. The method of claim 26 further comprising using the second program to automatically update the filtering and aggregation performed by the first program.

33. A network usage tracking system comprising:

means for accessing network communications usage information;

means for filtering and aggregating the network communications usage information using the first program;

means for completing a plurality of data records from the filtered and aggregated network communications usage information, the plurality of data records corresponding to network usage by a plurality of users;

means for storing the plurality of data records; and

means for merging duplicate records in the plurality of data records.

34. The network usage tracking system of claim 34 wherein the means for completing the plurality of data records includes one or more networked computers running one or more programs.

35. The network usage tracking system of claim 34 wherein the means for storing the plurality of data records includes a relational database.

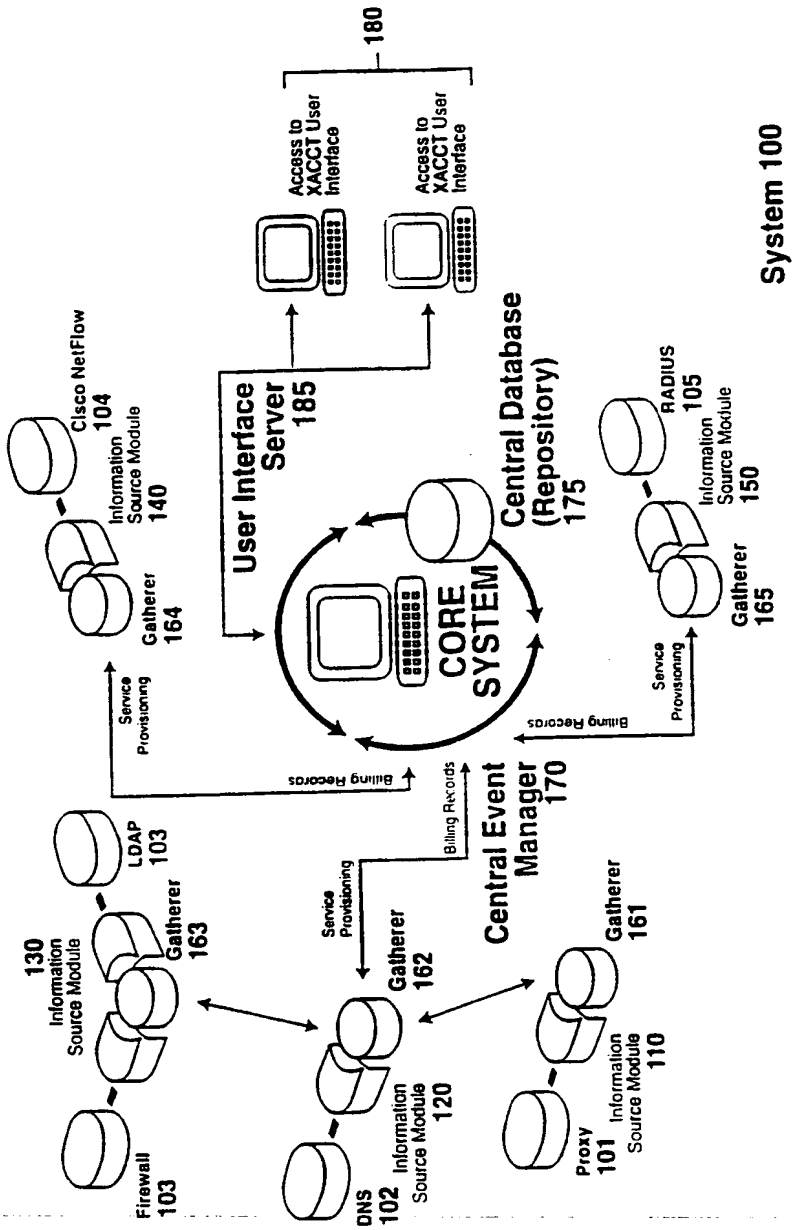
36. The network usage tracking system of claim 34 wherein the means for storing the plurality of data records includes an object database.

37. A system for accounting for network usage comprising:

a plurality of gatherers coupled to receive network usage information, each gatherer for performing data enhancements on the network information to create a plurality of data records; and

a central event manager coupled to receive the plurality of data records, the central event manager merging duplicate records in the plurality of data records, the duplicate records representing the same network usage information.

38. The system of claim 37 further comprising a customer care and billing application for receiving the plurality of data records and generating bills.



System 100

Fig. 1

Distributed System Architecture

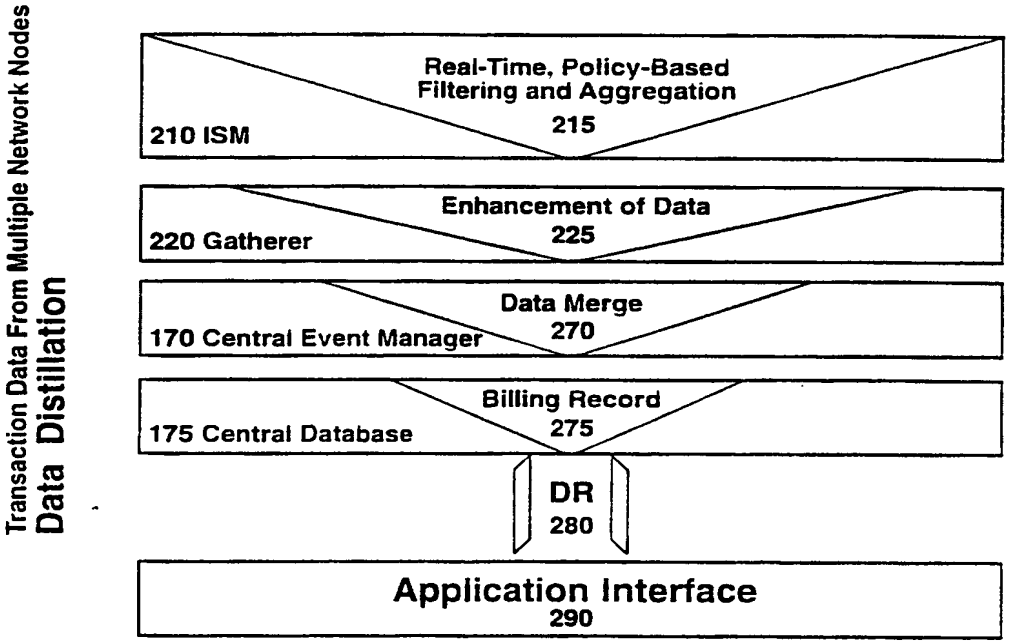


Fig. 2

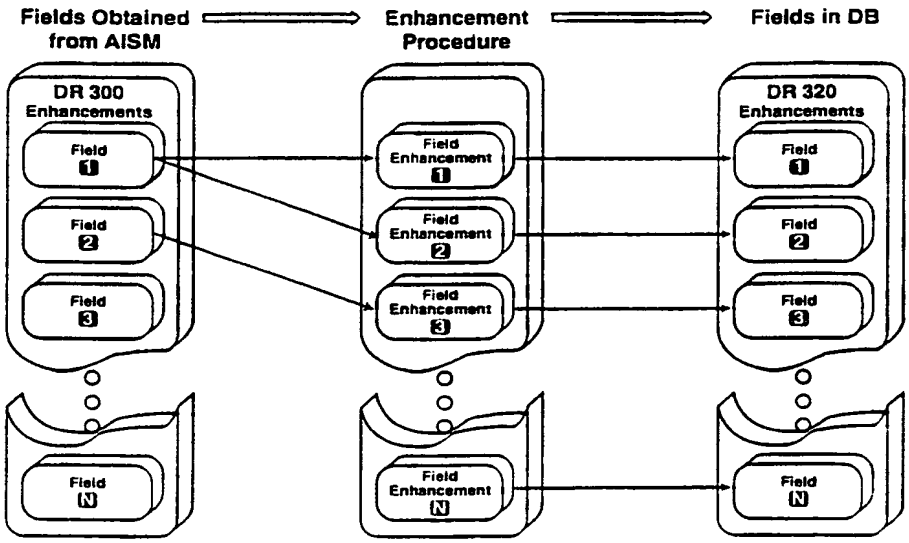


Fig. 3

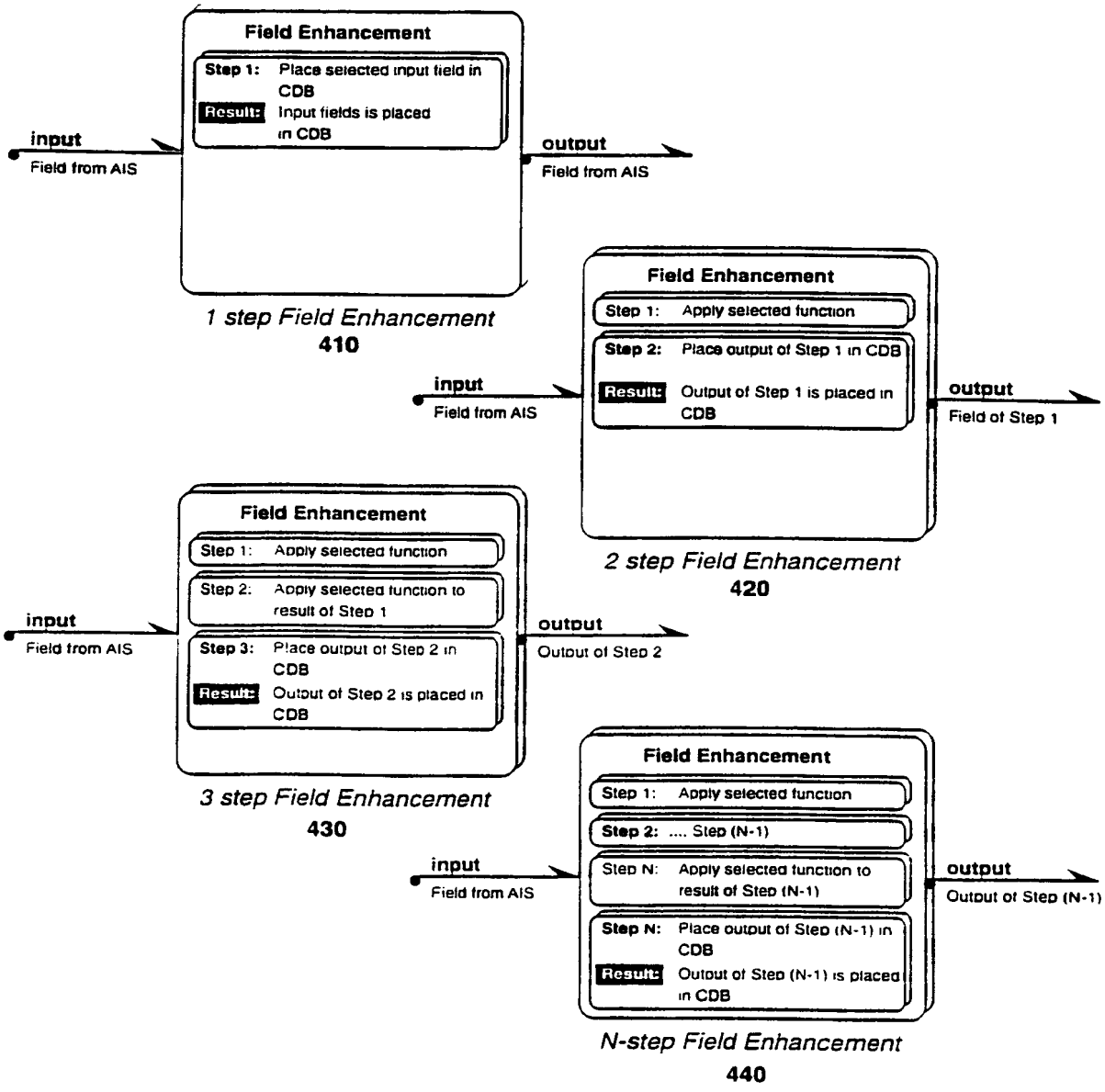


Fig. 4A

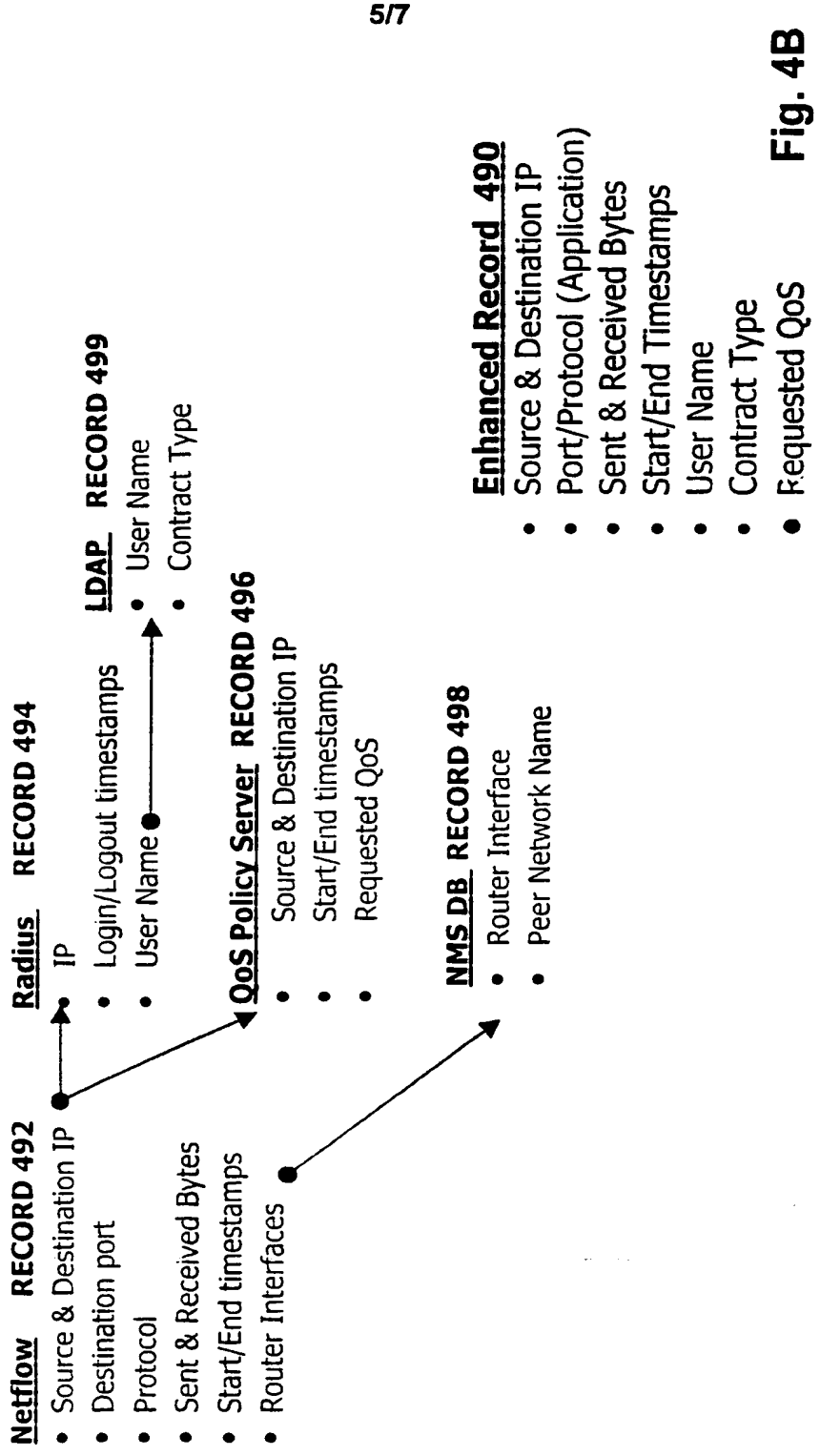


Fig. 4B

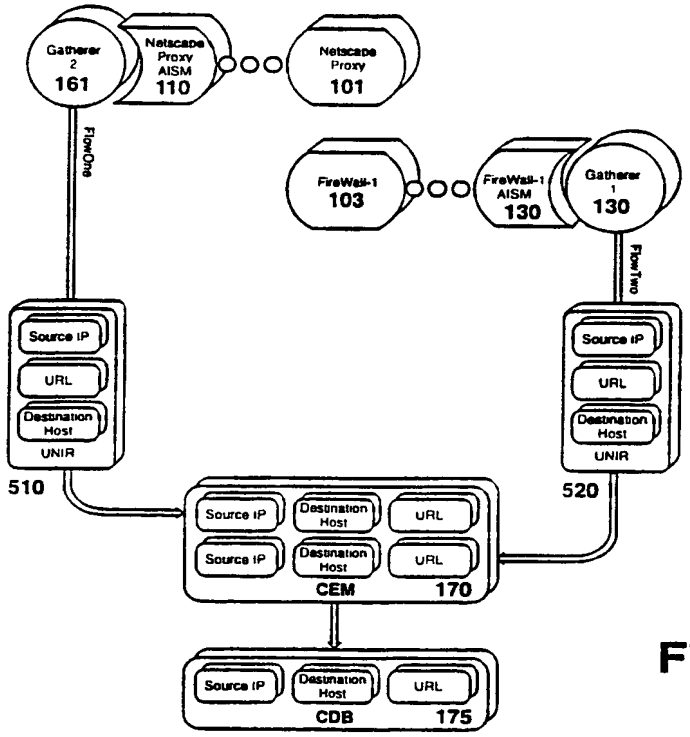


Fig. 5

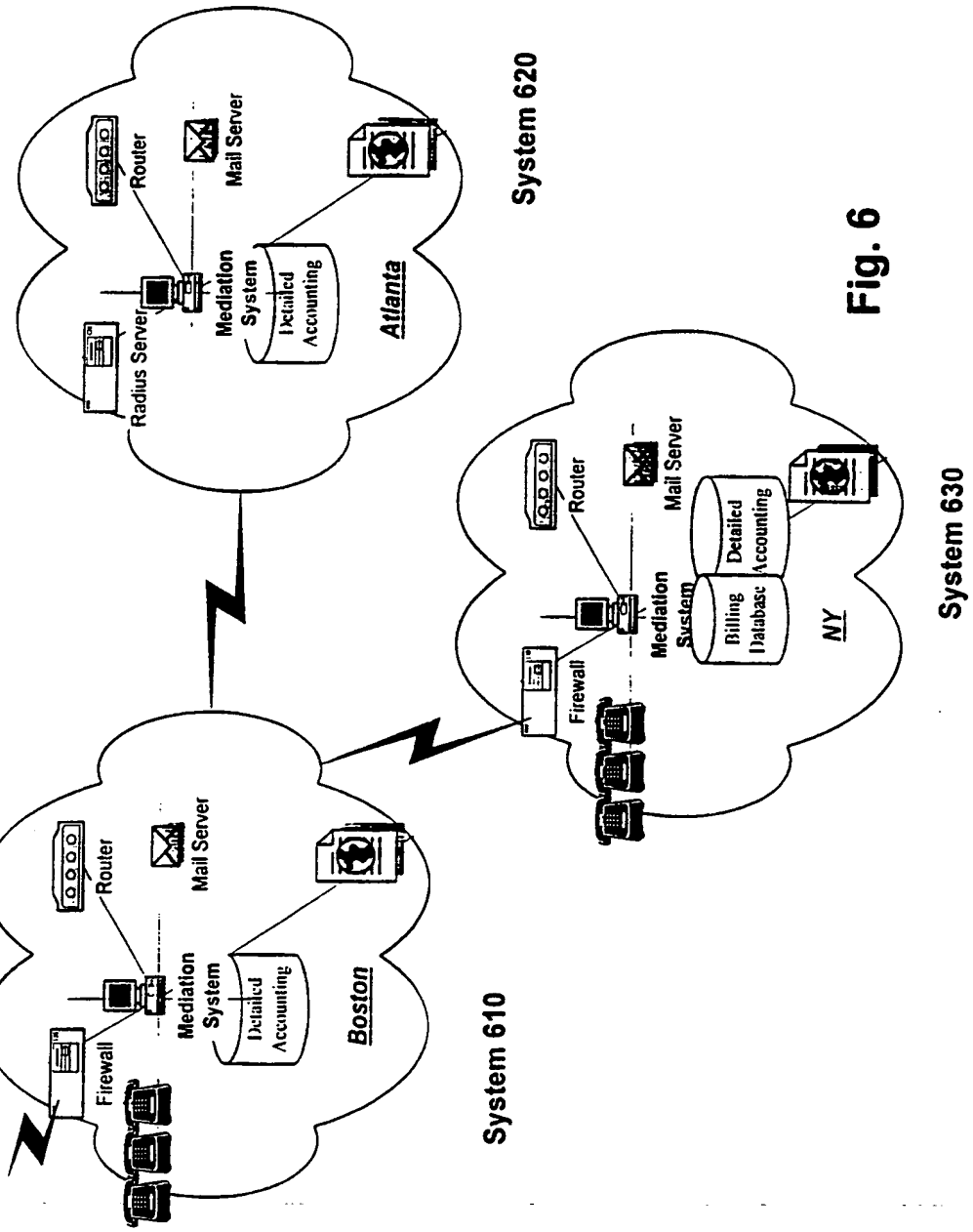


Fig. 6

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
G06F 17/60, 17/30

A3

(11) International Publication Number: **WO 99/27556**

(43) International Publication Date: 3 June 1999 (03.06.99)

(21) International Application Number: PCT/US98/24963

(22) International Filing Date: 20 November 1998 (20.11.98)

(30) Priority Data:

60/066,898	20 November 1997 (20.11.97)	US
60/109,095	19 November 1998 (19.11.98)	US

(63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Applications

US	60/066,898 (CIP)
Filed on	20 November 1997 (20.11.97)
US	60/109,095 (CIP)
Filed on	19 November 1998 (19.11.98)

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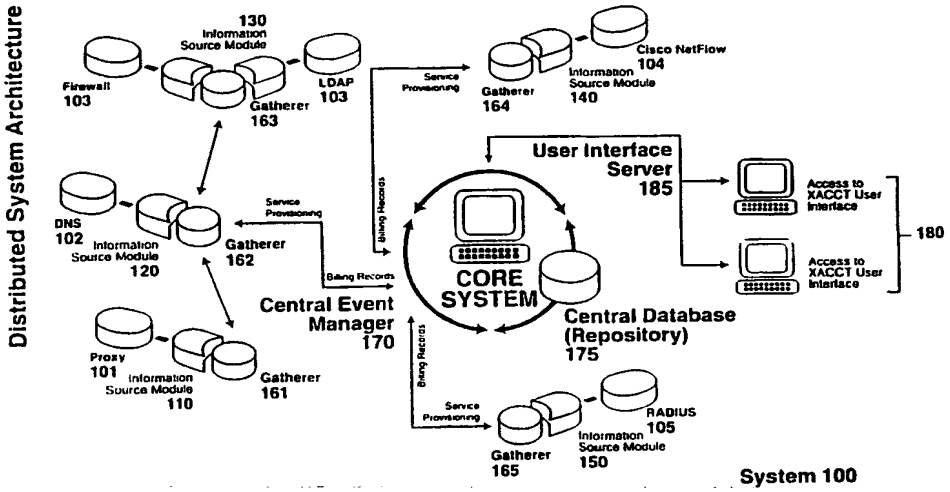
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(88) Date of publication of the international search report:
5 August 1999 (05.08.99)

(54) Title: NETWORK ACCOUNTING AND BILLING SYSTEM AND METHOD



(57) Abstract

In some embodiments, network traffic information is captured at network information sources. These sources provide detailed information about the network communications transactions at a network device. Importantly, different types of sources can provide different types of information. Gatherer devices gather the detailed information from the various information source devices and convert the information into standardized information. The gatherer devices can correlate the gathered information with account information for network transaction accounting. Manager devices manage the gatherer devices and store the gathered standardized information. The manager devices eliminate duplicate network information that may exist in the standardized information. The manager devices also consolidate the information. Importantly, the information stored by the manager devices represents the consolidated, account correlated, network transaction information that can be used for billing or network accounting. The system thereby provides a distributed network accounting and billing system.

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INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/US 98/24963

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06F17/60 G06F17/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G06F H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 91 03023 A (COMPUCOM COMMUNICATIONS CORP) 7 March 1991 see page 41 - page 44 see abstract; example 1 see page 16, line 1 - page 17, line 29	1-38
X	REDMOND C ET AL: "Dynamic charging for information services" IEE COLLOQUIUM ON CHARGING FOR ATM - THE REALITY ARRIVES (REF. NO.1997/328), LONDON, UK, 20 NOV. 1997, pages 13/1-10, XP002101632 1997, London, UK, IEE, UK see page 1-10	1-38

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Date of the actual completion of the international search	Date of mailing of the international search report
29 April 1999	28/05/1999

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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information on patent family members

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